

THE ANOPLURA OF NEW JERSEY¹

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The Anoplura of New Jersey have never been the subject of critical research, although the Anoplura of the United States have been treated in the works of Kellogg and Ferris (1915), and again by Ferris (1951). The New Jersey records of lice, both the biting and the sucking lice, were few until 1951, when the present study was begun under the leadership of Dr. Elton J. Hansens, in cooperation with the New Jersey Department of Agriculture and the New Jersey Division of Fish and Game.

LITERATURE SURVEY

Smith (1910), in his report of the insects known to occur in New Jersey, notes the presence of the following eleven species of sucking lice: *Phthirus pubis* Linnaeus, *Pediculus humanus* (L.), *Haematopinus asini* (L.), *Haematopinus eurysternus* (Nitzsch), *Haematopinus suis* (L.), *Linognathus setosus* (von Olfers), *Linognathus vituli* (L.), *Haemodipsus ventricosus* (Denny), *Polyplax spinulosa* (Burmeister), *Hoplopleura acanthopus* (Burmeister), and *Enderleinellus suturalis* (Osborn).

Since sucking lice are known to be host specific to a rather high degree, lists of the Anoplura collected in other coastal states are of assistance in studying the New Jersey fauna. Records of lice from this area have been reported by Britton (1923), Leonard (1928), Hasseltine (1929), MacCreary (1945), Kntuson and Szymkowicz (1952), and Ferris (1951).

COLLECTION OF LICE

The specimens of sucking lice were collected in several ways. The lice parasitizing the smaller mammals (mice, rats, shrews,

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etc.) were obtained by placing the freshly captured host in a mason jar which contained water, lindane, and a detergent or wetting agent. The jars were then shaken approximately 100 times which was sufficient agitation to remove the parasites from the host animal. The host was then discarded and the solution in the jar was passed through a 60-mesh screen. The ectoparasites were removed from the screen and stored in 70 per cent ethanol until they were mounted.

ECTOPARASITE MOUNTING TECHNIQUES

Two methods of mounting and preserving lice were used during the present study, (1) the KOH-balsam technique (modified from Holland, 1949) and (2) the Hoyer's medium technique (Baker and Wharton, 1952).

ANIMALS SURVEYED

During this ectoparasite survey, a large number of host animals was surveyed. The majority of these animals was small rodents. A summary of the kinds and number of host animals together with the extent of infestation by lice is presented in Table 1.

New Jersey Anoplura Record

The following section of this paper deals with those species of sucking lice which have definitely been found in New Jersey. In the list of collections, the names of collectors are abbreviated as follows: Paul Burbutis (PB.), Charles T. O'Connor (OC.), William Cavanaugh (WC.), Mrs. Eileen Donohoe (D.), Carl French (F.), Samuel Goldwasser (SG.), Elton J. Hansens (EJH.), William Keller (K.), Robert Messersmith (BM.), Ernest Mills (EM.), John Medoff (JM.), Robert Mangold (RM.), R. J. Sim (SIM.), Walter Roberts (R.), George Pope (GP.), F. Scott Stinson (FS.), and Richard D. Worth (RDW.).

Enderleinellus longiceps (Kellogg and Ferris)

Since only two specimens of this louse were collected during the entire ectoparasite survey, this species may be one of rarer species of Anoplura occurring in New Jersey. This species, like other *Enderleinellus spp.*, is, however, extremely small and some specimens might very well have been overlooked. This louse appears to be restricted to the genus *Sciurus*.

TABLE 1

KINDS AND NUMBERS OF HOST ANIMALS SURVEYED, AND THE EXTENT OF INFESTATION BY LICE

Name	Total Animals	Total Lice Collected	Per-cent Infested
Virginia opossum (<i>Didelphis virginiana</i>)	13	0	0.0
Short-tailed shrew (<i>Blarina b. brevicauda</i>)	81	2	0.02
Smoky shrew (<i>Sorex fumeus</i>)	1	0	0.0
Common mole (<i>Scalopus aquaticus</i>)	1	0	0.0
Star-nosed mole (<i>Condylura cristata</i>)	1	0	0.0
Skunk (<i>Mephitis mephitis</i>)	4	0	0.0
Weasel (<i>Mustela novaboracensis</i>)	3	0	0.0
Raccoon (<i>Procyon lotor</i>)	4	0	0.0
Gray fox (<i>Urocyon cinereoargenteus</i>)	3	0	0.0
Red-backed mouse (<i>Clethrionomys gapperi</i>)	2	0	0.0
Meadow mouse (<i>Microtus p. pennsylvanicus</i>)	152	142	22.0
Deer mouse (<i>Peromyscus leucopus</i>)	157	20	7.0
Pine mouse (<i>Pitymys pinetorum</i>)	146	55	6.2
Jumping mouse (<i>Zapus</i> sp.)	9	0	0.0
House mouse (<i>Mus musculus</i>)	44	0	0.0
Norway rat (<i>Rattus norvegicus</i>)	2796	102,130	62.0
Muskrat (<i>Ondatra zibetlica</i>)	4	0	0.0
Gray squirrel (<i>Sciurus coroninensis</i>)	28	30	32.2
Red squirrel (<i>Sciurus hudsonicus</i>)	3	0	0.0
Fox squirrel (<i>Sciurus niger</i>)	2	1	50.0
Woodchuck (<i>Marmota monax</i>)	3	3	33.0
Cottontail rabbit (<i>Sylvilagus floridanus</i>)	381	0	0.0
Beaver (<i>Castor canadensis</i>)	1	0	0.0
Dog (<i>Canis familiaris</i>)	14	many	—
Deer (<i>Odocoileus virginianus</i>)	1	0	0.0
Man (<i>Homo sapiens</i>)	5	many	—
Horse (<i>Equus caballus</i>)	1	many	—
Cow (<i>Bos taurus</i>)	1	many	—
Totals:	3861	102,836	

Previous records. None.

New records. Glen Ridge, 18. Dec. 52, ex *Sciurus carolinensis*, 2M (RDW.).

Enderleinellus marmotae (Ferris)

Although not many of these lice were collected, they are prob-

ably abundant on and restricted to the woodchuck, *Marmota monax* L., wherever that animal is found in New Jersey.

Previous records. None.

New records. New Brunswick, 27. May 53, ex *Marmota monax*, 3F, 4M. (PB.).

Enderleinellus suturalis (Osborn)

Smith (1910), reported that *E. suturalis* occurred on the chipmunk, *Tamias striatus* (L), and the gray gopher, *Citellus franklini* (Sabine), in New Jersey. Neither of these two animals was collected during the present New Jersey ectoparasite survey.

Previous records. Recorded by Smith (1910).

New records. None.

Hoplopleura acanthopus (Burmeister)

This species of Anoplura is very abundant in New Jersey, particularly on the meadow mouse, *Microtus p. pennsylvanicus*.

Previous records. Recorded by Smith (1910).

New records.

Chester, 17. Dec. 52, ex *Microtus pennsylvanicus pennsylvanicus*, 3F. (FS.); 18. Dec. 52, ex *M. p. pennsylvanicus*, 6F, 1M. (FS.).

Elizabeth, 5. April. 52, ex *Blarina brevicauda brevicauda*, 1F. (PB.).

Holland Brook, 17. April. 52, ex *M. p. pennsylvanicus*, 15M, 9F. (PB.) 18 April. 52, ex *M. p. pennsylvanicus*, 4F, 2M. (PB.); 6. May. 2, ex *M. p. pennsylvanicus*, 1F, 2M. (PB.).

Long Valley, 6 Feb. 53, ex *M. p. pennsylvanicus*, 1F. (FS.).

Middlebush, 11. Feb. 53, ex *M. p. pennsylvanicus*, 2F, 9M. (PB.).

New Brunswick, 16. Feb. 53, ex *Peromyscus leucopus*, 1F. (PB.); 10. Feb. 53, ex *Pitymys pinetorum*, 4F, 1M. (PB.); 11. Feb. 53, ex *Pitymys pinetorum*, 10F, 4M. (PB.); 13. Feb. 53, 22F, 7M. (PB.).

Newfoundland, 10. Feb. 53, ex *M. p. pennsylvanicus*, 1F. (FS.).

Newton, 6. Jan. 53, ex *M. p. pennsylvanicus*, 4F, 1M. (FS.).

Princeton, 22. Jan. 53, ex *M. p. pennsylvanicus*, 8F. (R.); 20. Feb. 53, ex *M. p. pennsylvanicus*, 10F, 2M. (GP.).

Riverton, 21. April. 53, ex *Pitymys pinetorum*, 1F. (P.B.).

Robbinsville, 16. Jan. 53, ex *M. p. pennsylvanicus*, 3F, 3M. (GP.).

Rosemont, 14. Jan. 3, ex *M. p. pennsylvanicus*, 1F. (FS.).

Somerville, 22. April. 3, ex *M. p. pennsylvanicus*, 2F, 1M. (PB.).

Somerdale, 6. Feb. 53, ex *M. p. pennsylvanicus*, 1F. (PB.).

Stelton, 17. Feb. 53, ex *M. p. pennsylvanicus*, 1F. (PB.); 19.

Feb. 53, ex *M. p. pennsylvanicus*, 1F, 1M. (PB.); 26. Feb.

53, ex *M. p. pennsylvanicus*, 3F, 1M. (PB.); 13. March. 53,

ex *M. p. pennsylvanicus*, 8F, 1M. (PB.); 16. March. 53, ex

M. p. pennsylvanicus, 3F, 1M. (PB.); 24. Feb. 53, ex *Peromyscus leucopus*, 1F. (PB.).

Hoplopleura heaperomydis (Osborn)

This species of sucking louse is widely distributed in New Jersey, and like *H. acanthopus*, is restricted to the smaller animals. Previous records. None.

New records.

Bordentown, 27. Jan. 53, ex *Peromyscus leucopus*, 1F. (GP.);

27. Jan. 53, ex *Blarina brevicauda brevicauda*, 1M. (GP.).

Clinton, 24. Nov. 51, ex *Microtus pennsylvanicus pennsylvanicus*, 1M. (D.).

Dividing Creek, 15. Jan. 53, ex *Peromyscus leucopus*, 3F. (PB.).

New Brunswick, 3. Feb. 53, ex *Peromyscus leucopus*, 5F, 3M. (PB.); 13. Feb. 53, ex *Pitymys pinetorum*, 2F. (PB.).

Seabrook, 22. Sept. 52, ex *Peromyscus leucopus*, 1F. (EJH.).

Tabernacle, 13. Nov. 53, ex *Peromyscus leucopus*, 1F. (SIM.).

Thompson's Beach, 11. Feb. 53, ex *Peromyscus leucopus*, 1M. (K.).

Polyplax abscisa (Fahrenheit)

This species of Anoplura is probably well established in New Jersey on a variety of small rodents.

Previous records. None.

New records.

Fellowship, 22. Jan. 53, ex *Pitymys pinetorum*, 1F. (FS.).

Pittstown, 16. Jan. 53, ex *Microtus pennsylvanicus pennsylvanicus*, 1M (FS.).

Princeton, 9. Feb. 53, ex *P. pinetorum*, 1M. (GP.).

Robbinsville, 24. July. 53, ex *M. p. pennsylvanicus*, 1M. (WC.).

Polyplax serrata (Burmeister)

According to H. D. Pratt of the United States Public Health Service, *Polyplax serrata* is a rare species of Anoplura in the United States. He remarks in correspondence with the author that "Eads has one Texas record; there are some old United States Public Health records of this species on laboratory mice which may or may not be correct, and there is one collection from Utah." Although more than 150 meadow mice were collected during this survey, only five specimens of *P. serrata* were taken from one of these mice. The species is considered by the author to be extremely rare in New Jersey.

Previous records. None.

New records.

Oldwick, 9. April. 53, ex *Microtus p. pennsylvanicus*, 1F, 4M. (FS.).

Polyplax spinulosa (Burmeister)

The spiny-rat louse was collected in great numbers from rats throughout the entire state of New Jersey. *P. spinulosa* was by far the most abundant species of sucking louse collected during this survey, with 102,130 adult and nymphal lice being collected from 2,796 Norway rats, *rattus norvegicus* (Berkenhout).

Previous records. Recorded by Smith (1910).

New records. Space does not permit the citation of each collection—suffice it to state that the spiny-rat louse was collected from 79 different locations (including collections from all twenty-one counties).

Haematopinus asini (L.), The horse louse

This species of Anoplura is to be found on horses and asses, probably throughout the state.

Previous records. Recorded by Smith (1910).

New records. Clinton, 20. Dec. 46, ex *Equus caballus*, many F, many M. (D.).

Haematopinus eurysternus (Nitzsch), The short-nosed ox-louse.

This louse is occasionally found on dairy and beef cattle, *Bos taurus* L., in New Jersey.

Previous records. Recorded by Smith (1910).

New records. Clinton, 26. Nov. 46, ex *Bos taurus*, many F, many M. (D.).

Haematopinus suis (L.), The hog louse

The hog louse is the largest of the Anoplura to be found in New Jersey.

Previous records. Recorded by Smith (1910).

New records. None.

Neohaematopinus sciurinus Mjoberg

This louse is specific to the family Sciuridae and in New Jersey is commonly found on the gray squirrel, *Sciurus carolinensis leucotis* (Gapper.).

Previous records. None.

New records.

Bound Brook, 15. Jan. 53, ex *Sciurus carolinensis leucotis*, 1F. (RDW.).

Glen Ridge, 18. Dec. 52, ex *S. c. leucotis*, 1F, 1M. (RDW.).

Millburn, 24. Feb. 53, ex *S. c. leucotis*, 2F, 1M. (RDW.).

Montclair, 10. Dec. 52, ex *S. c. leucotis*, 3F, 2M. (RDW.);

7. Sept. 53, ex *S. c. leucotis*, 1F, (RDW.).

Nutley, 12. Jan. 52, ex *S. c. leucotis*, 3F. (RDW.).

Verona, 11. Dec. 53, ex *S. c. leucotis*, 4F. (RDW.).

Westfield, 8. Jan. 53, ex *S. c. leucotis*, 2F. (RDW.); 7. Sept. 53, ex *S. c. leucotis*, 3F. (RDW.).

Linognathus pedalis (Osborn), The sheep foot-louse

This louse can probably be found on sheep, *Ovis aries* L., and goats, *Capra hircus* L., throughout New Jersey.

Previous records. This species was recorded by Smith (1910).

New records. None.

Linognathus setosus (von Olfers), The dog louse

The dog louse is specific to members of the family Canidae and may occur in New Jersey where dogs and/or red foxes are found.

Previous records. Recorded by Smith (1910).

New records.

Clinton, 30. Dec. 52, ex *Canis familiaris*, many F, many M. (D.).

Packanack Lake, 15. Jan. 54, ex *Canis familiaris*, many F, many M. (EJH.).

Linognathus vituli (L.), The long-nosed ox-louse

The long-nosed ox-louse, like the short-nosed ox-louse, is specific to and probably fairly abundant on dairy and beef cattle, *Bos taurus*, throughout the state of New Jersey.

Previous records. Recorded by Smith (1910).

New records. Clinton, 26. Nov. 46, ex *Bos taurus*, many F, many M. (D.).

Pediculus humanus L., The human louse

The species *Pediculus humanus* L. includes the two forms *Pediculus humanus humanus* deGreer and *Pediculus humanus capitis* deGreer, commonly called the body louse and the head louse respectively. These specific parasites of man are to be found in New Jersey wherever their existence is permitted.

P. humanus is a capable vector of diseases such as Epidemic relapsing fever, epidemic typhus fever, trench fever, and possibly other infections. In addition to the above, the intermittent feeding of these lice very often causes serious annoyance to the host.

Previous records. Recorded by Smith (1910).

New records. None.

Phthirus pubis (L.), The pubic louse

In New Jersey, as elsewhere, the pubic louse or crab louse can be found quite frequently on people with low hygienic standards. Previous records. Recorded by Smith (1910).

New records. New Brunswick, 1. Dec. 53, ex *Homo sapiens*, many F, many M. (OC.).

Haemodipsus ventricosus (Denny)

This species of Anoplura is to be found on rabbits, both domestic and wild.

Previous records. Recorded by Smith (1910).

New records. None.

DISCUSSION

The majority of the host records established during the course of this study are new for New Jersey. The host specificity of

Anoplura is illustrated by the fact that in general, one species of louse parasitizes only one species of host. However, several species of hosts, notably the meadow mouse and the pine mouse, were found to harbor two or more different species of lice.

The Anoplura of New Jersey

The thirteen species of Anoplura collected during the present survey plus the five additional species collected by previous workers, (Smith, 1910), make a total of eighteen species of sucking lice known to occur in New Jersey. These eighteen are discussed on the preceding pages.

In addition, there are thirteen other species of Anoplura that probably occur in New Jersey because their hosts are known to be present in the state, therefore, their ectoparasites are also probably present. Several of these species have been collected in New York state and/or Connecticut.

When these hosts are collected and examined in sufficient numbers in New Jersey, the following Anoplura will probably be added to the list:

1. *Polyplax auricularis* Kellogg and Ferris

Ferris (1951), reports that this louse occurs on members of the genus *Peromyscus*, which is common in New Jersey.

2. *Haematopinooides squamosus* (Osborn)

This louse is found on the common mole, *Scalopus aquaticus* Linnaeus, and has been reported from Iowa, Kansas, Illinois, and New York (Ferris, 1951).

3. *Solenopotes capillatus* Enderlein

This louse occurs on dairy and beef cattle and has been collected in New York state.

4. *Hoplopleura erratica* (Osborn)

This louse parasitizes the chipmunk, none of which was collected during this survey. However, *H. erratica* has been reported from Ossining New York (Ferris, 1928) and from Connecticut (Osborn, 1923).

5. *Hoplopleura sciuricola* Ferris

This louse is found on species of the genus *Sciurus* which are common in New Jersey.

6. *Hoplopleura trispinosa* Kellogg and Ferris

The flying squirrels, *Glaucomys spp.*, which are present in New

Jersey, are reported as the preferred hosts of this species of Anoplura. No *Glaucomys* spp. were collected during this survey.

7. *Neohaematopinus sciuropteri* (Osborn)

This louse also occurs on flying squirrels and probably is present in New Jersey.

8. *Enderleinellus nitzschi* (Burmeister)

This louse is probably present in New Jersey on the family Sciuridae.

9. *Enderleinellus tamiasis* Fahrenholz

This louse probably occurs in New Jersey on the chipmunk.

10. *Microphthirus uncinatus* (Ferris)

According to Ferris (1951), this species of sucking louse parasitizes the flying squirrel. It is probably present in New Jersey.

11. *Linognathus ovillus* (Neumann)

This louse is to be expected in New Jersey on sheep and goats.

12. *Linognathus africanus* Kellogg and Paine

This species of Anoplura parasitizes sheep and goats.

13. *Linognathus stenopsis* (Burmeister)

This louse is commonly found on sheep and goats.

NEW JERSEY HOST LIST

From information collected during this study and from the literature, it is possible to compile a faunal list of the Anoplura occurring in New Jersey as set forth in Table 2.

TABLE 2.
THE NEW JERSEY HOST-LICE RELATIONSHIPS

Host	Louse	Present Study	Previous Record	Probably Occurs
Common mole	<i>Haematopinoidea squamosus</i>			x
Short-tailed shrew	<i>Hoplopleura acanthopus</i>	x*		
	<i>Hoplopleura hesperomydis</i>	x*		
Meadow mouse	<i>Hoplopleura acanthopus</i>	x	x	
	<i>Hoplopleura hesperomydis</i>	x*		
	<i>Polyplax absisa</i>	x		
	<i>Polyplax serrata</i>	x*		
Deer mouse	<i>Hoplopleura acanthopus</i>	x		
	<i>Hoplopleura hesperomydis</i>	x		

TABLE 2. (Continued)

Host	Louse	Present Study	Previous Record	Probably Occurs
Pine mouse	<i>Hoplopleura acanthopus</i>	x		
	<i>Hoplopleura hesperomydis</i>	x*		
	<i>Polyplax abscisa</i>	x*		
House mouse	<i>Polyplax serrata</i>			x
Gray squirrel	<i>Neohaematopinus sciurinus</i>	x		
	<i>Hoplopleura sciuricola</i>			x
	<i>Enderleinellus longiceps</i>	x		
Red squirrel	<i>Enderleinellus nitzschi</i>			x
	<i>Neohaematopinus sciurinus</i>			x
	<i>Hoplopleura sciuricola</i>			x
	<i>Enderleinellus longiceps</i>			x
Fox squirrel	<i>Enderleinellus nitzschi</i>			x
	<i>Neohaematopinus sciurinus</i>			x
	<i>Hoplopleura sciuricola</i>			x
	<i>Enderleinellus longiceps</i>	x		
Flying squirrel	<i>Enderleinellus nitzschi</i>			x
	<i>Hoplopleura trispinosa</i>			x
	<i>Neohaematopinus sciuropteri</i>			x
Chipmunk	<i>Microphthirus uncinatus</i>			x
	<i>Hoplopleura erratica</i>			x
	<i>Enderleinellus suturalis</i>		x	
Gray gopher	<i>Enderleinellus tamiasis</i>			x
Black rat	<i>Enderleinellus suturalis</i>		x	
Norway rat	<i>Polyplax spinulosa</i>			x
Woodchuck	<i>Polyplax spinulosa</i>	x	x	
Rabbit	<i>Enderleinellus marmotae</i>	x		
Dog	<i>Haemodipsus ventricosus</i>		x	
Dog	<i>Linognathus setosus</i>	x	x	
Pig	<i>Haematopinus suis</i>		x	
Dairy and beef cattle	<i>Haematopinus eurysternus</i>	x	x	
	<i>Linognathus vituli</i>	x		
	<i>Solenopotes capillatus</i>			x
Goat and/or sheep	<i>Linognathus africanus</i>			x
	<i>Linognathus ovillus</i>			x
	<i>Linognathus pedalis</i>		x	
	<i>Linognathus stenopsis</i>			x
Horse	<i>Haematopinus asini</i>	x	x	
Man	<i>Pediculus humanus</i>		x	
	<i>Phthirus pubis</i>	x	x	

* Host-lice relationship found during this study and not recorded in the literature.

SUMMARY AND CONCLUSIONS

During the years 1951 and 1953 an ectoparasite survey was conducted in New Jersey by the Department of Entomology, Rutgers University, in cooperation with the New Jersey Department of Agriculture and the New Jersey Division of Fish and Game, in order to study the Anoplura occurring in the state.

A total of 102,386 lice was collected from approximately 3,900 host animals. Thirteen species of Anoplura were found, six of which were not previously recorded from New Jersey. One, *Polyplax serrata*, is probably extremely rare in New Jersey.

The thirteen species collected during this survey plus five additional species collected by Smith (1910), make a total of eighteen species of Anoplura known to occur in New Jersey.

In addition to these eighteen, the author believes that thirteen more species occur in the state, thus making a total of thirty-one species of Anoplura in New Jersey.

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